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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/901,526	07/09/2001	Matthias Forster	INF-1078	7099

7590

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EXAMINER

MULPURI, SAVITRI

ART UNIT

PAPER NUMBER

2812

DATE MAILED: 10/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.  
09/901,526

Applicant(s)  
Mathias Foraster et al

Examiner  
Savitri Mulpuri

Art Unit  
2812



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on Sep 20, 2003
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 12-23 is/are pending in the application.
- 4a) Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 12-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some\* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). \_\_\_\_\_ 6) ☐ Other:

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### DETAILED ACTION

This action is in response to the applicant's amendment and declaration under rule 131, filed on 2/1/2003

#### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(e) the invention was described in-

- (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
- (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 12- 16, 18- 19, 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thakur et al (US 6,187,628).

Thakur et al discloses a method of growing silicon layer with micro roughness or hemispherical growth by the following process: Providing a substrate " 12" in a chemical vapor deposition process chamber; growing polysilicon layer " 16" over the substrate; growing a thin oxide layer "18" ; generating a process gas containing semiconductor material to grow a rough polysilicon silicon layer "20" in in-situ chemical vapor deposition. Thakur teaches without annealing the rough silicon layer "20" , growing dielectric layer "20". . Thakur et al grows silicon

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layer in single growth step exactly similar to what is claimed in instant process. Thakur et al discloses providing silane gas at growth temperature 500- 700 C and pressure in the range of 70 m Torr to 50 Torr, which is within claimed pressure (100 m Torr to 600 m Torr) to produce rough polysilicon with the thickness in the range of 300 angstroms to 100 angstroms (see fig. 1 and col. 3, lines 23- 47). Thakur et al further discloses precleaning the substrate in HF prior to growth to inherently provide oxide free surface because HF etches natural oxide deposited on silicon substrate surface (see col. 2, lines 50-54). Thakur et al discloses the whole process is applied to form either trench or stacked capacitor for DRAMs (see col. 1, lines 24-27). Since similar operating conditions, as claimed growth conditions, are set to grow rough polysilicon in Thakur et al, Amendment to claims of "clear spacing of between lateral surfaces of mutually adjacent grains". It is inherent that growth period in Thakur et al is similar to instant claimed growth time period. It is inherent in the invention of Thakur et al the spacing exists because general growth conditions are substantially same as claimed condition. Instant specification discloses grain spacing is functionally depends on several growth conditions including preliminary cleaning before growing silicon layer. However such condition is taught to clean natural oxide by HF etching.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 17, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thakur et al in combination with Lin (US 6,127,221) or Yew (US 5,753,359) discloses a method of making rough polysilicon in a single growth

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step with out annealing step at similar growth conditions as growth conditions recited in instant claimed conditions.

Tahkur et al does not teach hydrogen : silane ratio or nitrogen: silane ratio to grow rough polysilicon.

Lin et al teaches silane concentration  $10^{-3} \text{ m}^3$  in nitrogen ambient , which imply that nitrogen content is more compared with silane (see fig.5 spacious hemispherical grains and col. 5, lines 1-18). Yew discloses ratio of hydrogen to silane is 98 percent (see abstract and col. 7, lines 40-56). It would have been obvious to one of ordinary skill in the art to use heavy dilution of silane with nitrogen or hydrogen for hemispherical growth because Lin or Yew teaches the suitability of nitrogen to silane or hydrogen diluted silane is suitable for hemispherical growth. Since the dilution is more roughness is more, selecting the ratio of hydrogen or nitrogen to silane would have been well within the one of ordinary skill in the art depending on the required degree of roughness of the polysilicon and required thickness of capacitance fro DRAMs.

If not inherent as mentioned above, amendment to claims of "clear spacing of between lateral surfaces of mutually adjacent grains" is obvious result by changing one or more of growth parameters deposition time , deposition temperature, dilution ratio, preliminary cleaning etc.,

Response to the applicant's arguments: Applicant argues that amended claimed invention can be neither inherent nor obvious. However, Thakur et al teaches growth conditions for forming rough silicon layer are substantially same as the instant claimed growth conditions.

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to S. Mulpuri whose telephone number is 703-305-5184. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956..

  
SAVITRI MULPURI  
PRIMARY EXAMINER